

**REMARKS**

Claims 1, 2, 4–10, 12, and 13 are pending in this application. By this Amendment, claims 1, 5, and 9 are amended, and claims 3 and 11 are canceled. Support for the amendments to the claims may be found, for example, in original claim 3. No new matter is added.

Entry of the amendments is proper under 37 CFR §1.116 because the amendments: (a) place the application in condition for allowance, for the reasons discussed herein; (b) do not raise any new issue requiring further search and/or consideration, as the amendments amplify issues previously discussed throughout prosecution; and (c) do not present any additional claims without canceling a corresponding number of finally rejected claims. The amendments are necessary and were not earlier presented because they are made in response to arguments raised in the final rejection. Entry of the amendments is thus respectfully requested.

In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

**I. Rejections Under 35 U.S.C. §103**

**A. Zhan**

The Office Action rejects claims 1–4, 8, and 9 under 35 U.S.C. §103(a) as obvious over Zhan et al., J. Mater. Chem. (2001), 11:1606–11 ("Zhan"). Applicants respectfully traverse the rejection.

The Office Action indicates that it maintains its position that it would have been obvious to modify the binaphthyl unit disclosed by Zhan to arrive at the claimed binaphthyl unit because (1) such a modification would have been well within the scope of the skilled artisan at the time of the invention, and (2) Zhan teaches that the "electronic structures and photo- and electroluminescent (EL) properties of these polymers can be manipulated by simply varying

the nature of the co-units in the polymeric chain." The Office Action concludes that it would have been obvious to try different structural isomers.

The Office Action fails to respond to the following arguments previously made of record by the Applicants:

1. A mere statement that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness; and
2. Post-KSR case law establishes that the fact that a prior art compound is an isomer of the claimed compound is not sufficient on its own to support a *prima facie* case of obviousness.

Instead, the Office Action asserts that synthesizing a naphthyl precursor molecule where the positions of the hexoxy ( $C_6H_{13}O-$ ) groups and the Br- groups were reversed in terms of their position on each naphthyl unit would have been obvious and that the resulting copolymers made with the modified naphthyl units would have been expected to have similar electronic properties because "such copolymers would have merely been structural isomers of the polymers claimed by the applicant."

The Office Action fails to provide even a single piece of factual evidence to support its assertions. Moreover, its assertion that the resulting copolymers made with the modified naphthyl units would have been expected to have similar electronic properties is contrary to its assertion that Zhan teaches that the "photo-and electroluminescent (EL) properties of these polymers can be manipulated by simply varying the nature of the co-units in the polymeric chain." In other words, on one hand the Office Action asserts that Zhan teaches that modifying the structures of the copolymers will change the EL properties, while on the other hand, the Office Action asserts that modifying the structures of the copolymers would have been expected to result in copolymers with similar properties.

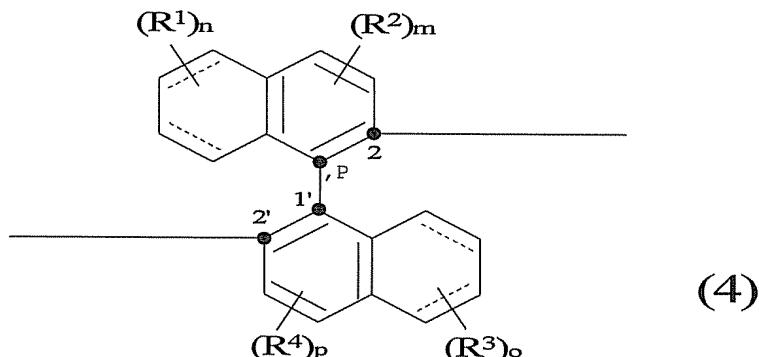
In response to Applicants' argument that Zhan teaches that it was concerned with not "significantly increasing the steric interactions in the polymer backbone," the Office Action asserts that "Zhan does not teach away from steric interactions because Zhan introduces sterically hindered substituents to affect the polymer main chain to improve EL efficiency." The Office Action, at page 11, concludes that Zhan teaches that "main chain rigidity improve[s] the EL efficiency."

In reply, Applicants respectfully point out that Zhan teaches that "a fluorine moiety with sterically hindered substituents is introduced into the PAE main chain to improve the EL efficiency and thermal stability of PAEs." *See* page 1606, sentences bridging 1<sup>st</sup> and 2<sup>nd</sup> columns. Thus, Zhan teaches that the substituents in the fluorene moiety are sterically hindered. This says nothing about steric hinderance in the polymer main chain. Nor does it teach that main chain rigidity improves EL efficiency. Rather, Zhan teaches that introducing fluorine moieties with sterically hindered substituents into PAE main chains improves EL efficiency and thermal stability.

Additionally, this portion of Zhan's disclosure relates to fluorene moieties, not the binaphthyl moiety of Zhan that the Office Action asserts would have been obvious to modify. With respect to the binaphthyl moiety, Zhan teaches that "binaphthyl and thiopene units are introduced into PAEs to reduce the rigid-rod confirmation and to improve the processability of the materials taking advantage of the bent bond angles at 2,5-thienelyene and of the large dihedral angle at binaphthyl." *See* page 1606, 2<sup>nd</sup> column, lines 6–9. In other words, Zhan specifically teaches introducing binaphthyl units into the polymer backbone to reduce the rigid-rod confirmation of the polymer backbone.

As discussed in the previous response, the binaphthyl structural units recited in the Applicants' claims have the opposite effect. Applicants' disclosure indicates that the claimed binaphthayl structural unit in which the aryl structural units of formula (1b) are bound to

position 2 and position 2' of 1,1'-binaphthyl unit as shown by the formula (4) below, form a highly rigid (linear)  $\pi$ -conjugated polymer.



This structure results in the formation of twists in the backbone of the EL polymer, which enables a conformation in which the interaction among polymer backbones is very weak. The steric hindrance caused by the naphthalene rings prevents rotation about the single bond between position 1 and position 1', so that the glass transition point of the polymer remains high despite the bent polymer backbone. As a result, the EL polymer retains highly stable morphology during and after film formation and has highly stable EL characteristics.

*See Applicants' specification, paragraphs [0015] to [0017].*

Despite the Office Action's assertions, nowhere does Zahn teach that main chain rigidity improves EL efficiency. Also, Zahn teaches introducing binaphthyl units into the polymer backbone to reduce the rigid-rod confirmation of the polymer backbone. However, Applicants' recited binaphthyl units increase the rigidity of the polymer backbone, thus having an effect that is opposite to that taught by Zahn. The Office Action has not provided a rationale or reason based on findings of fact that support its assertion that the claimed invention would have been obvious over Zahn. Indeed, the facts made of record establish that despite the Office Action's assertions, the claimed binaphthyl structural units do not exhibit the same properties as those taught by Zahn.

For at least the reasons discussed above, Zhan would not have rendered obvious claim 1. Claims 2–4, 8, and 9 depend from claim 1 and, thus, also would not have been rendered obvious by Zhan. Reconsideration and withdrawal of the rejection are respectfully requested.

**B. Zhan in view of Kim**

The Office Action rejects claims 5–7 and 10–13 under 35 U.S.C. §103(a) over Zhan in view of U.S. Patent No. 5,876,864 to Kim et al. ("Kim"). Applicants respectfully traverse the rejection.

Claims 5–7 and 10–13 each depend from and require all of the limitations of claim 1. Despite the Office Action's assertions, Zhan and Kim would not have rendered obvious claim 1, let alone any of its dependent claims. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

**II. Conclusion**

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are earnestly solicited.

Should the Examiner believe that anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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